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IS 11876 (1986): Airmeter [PGD 21: Meteorological Instruments]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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SPECIFICATION FOR AIRMETER

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Indian Standard

SPECIFICATION FOR AIRMETER

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Indian Standard

SPECIFICATION FOR AIRMETER

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 23 September 1986, after the draft finalized by the Meteorological Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 The accurate measurement of wind speed is of great importance in many fields of routine and research activities particularly in meteorology which generally necessitates elaborate arrangements of permanent installation and suitable exposure, etc. However, there exists the need of a compact portable instrument to provide a convenient means of measuring nominal airflow not exceeding about 50 km/h in ducts and confined spaces including mines, tunnels, subways and ventilation shafts. The most commonly used portable instrument is the airmeter which provides the direct dial reading of the run of wind past the meter when placed in the flow. The average speeds can be calculated by noting down the time interval between two readings.

0.3 Since no Indian Standard specification for such airmeter (vane anemometer) exists, the formulation of an Indian Standard for airmeters and their certification by BIS has become necessary with the increasing use and manufacture of such instruments in the country. This standard has, therefore, been prepared in the interest of standardization of airmeters in use in the country and of accuracy in the measurement of comparatively low wind speed in confined space. The testing of all airmeters made in the country and their initial certification after manufacture will, in future, be the sole responsibility of BIS.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 The standard specifies the requirements for a portable and compact airmeter for measuring comparatively low wind speed especially in confined space, ducts, etc.

*Rules for rounding off numerical values (*revised*).

2. DESCRIPTION

2.1 Ten/eight light weight aluminium vanes, supported on short radial arms, are mounted on a spindle capable of rotating freely, on jewel/miniature ball bearings, about a horizontal axis and protected by a cylindrical metal shield. The spindle is connected by a gear train to three/four pointers which rotate in front of dials to indicate linear flow in units, hundreds, thousands and tens of thousands metres — thus permitting a maximum flow measurement of 100 000 metres before repeating. A start-stop lever and a zero reset lever are provided. The dials along with the pointer are covered by a glass top to facilitate easy readings. A short detachable handle for mounting on the threaded base and a wooden carrying case, suitably cushioned inside are also provided.

3. MATERIAL

3.1 The vanes shall be made from light aluminium sheet, 0.5 mm thick.

3.2 The protective cylindrical shield shall be made from seamless aluminium/brass tubing or suitable aluminium/brass sheet, 1.7 mm thick.

3.3 The housing for the gear train and the rear bearing support shall be cast from good quality aluminium alloy LM 10/brass.

3.4 All gear wheels shall be made of hard drawn brass sheet.

3.5 All pinions and spindle shall be made of silver steel.

3.6 The base plate shall be made from hard brass.

3.7 All the pointers shall be made from brass/beryllium copper sheet of 0.56 mm thickness.

3.8 Handle shall be made of good quality aluminium rod or moulded plastic with suitable brass inserts.

3.9 Cams, spring, etc, shall be made from good quality steel.

4. DIMENSIONS

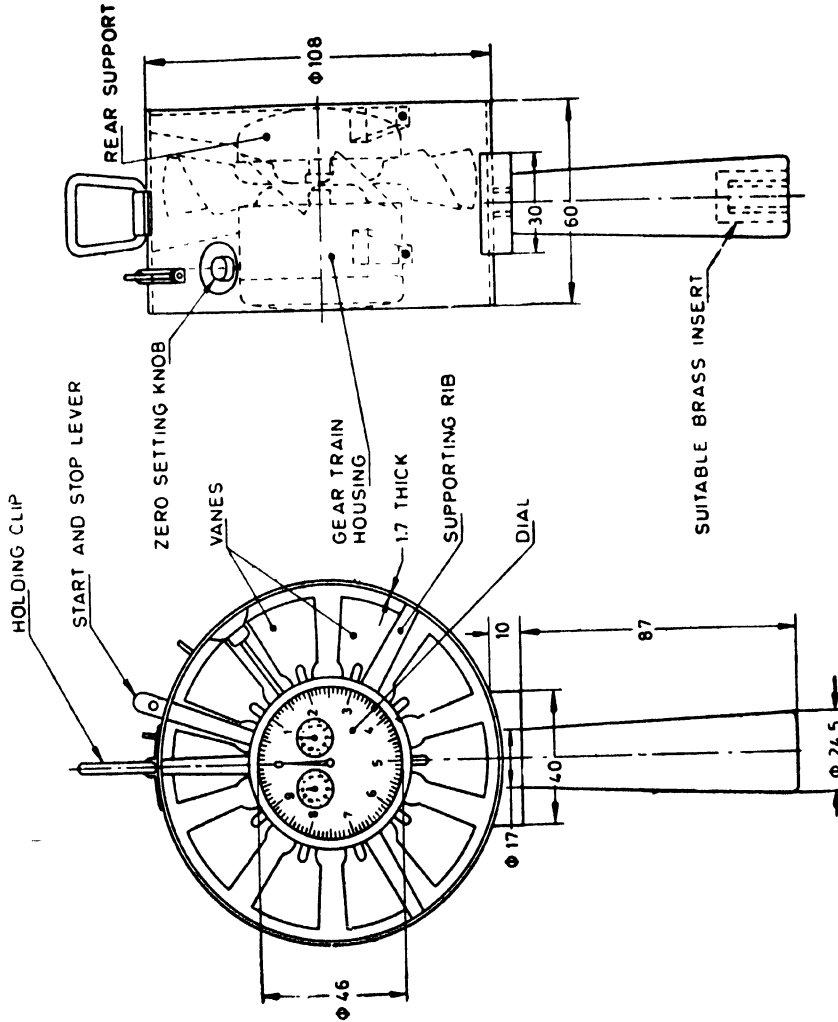
4.1 The general arrangement and dimensions of airmeter shall be as shown in Fig. 1.

4.1.1 The dimensions of vane rotor of airmeter shall be as shown in Fig. 2.

5. GENERAL REQUIREMENTS

5.1 Vane Rotor Assembly

5.1.1 Vane assembly shall either be made from a single sheet, 0.5 mm thick aluminium using a proper die punch or by rivetting individual vane on the radial arms of the rotor star formed from 0.8 mm thick hard brass sheet (Fig. 2).



All dimensions in millimetres.

FIG. 1 GENERAL ARRANGEMENT AND DIMENSIONS OF AIRMETER

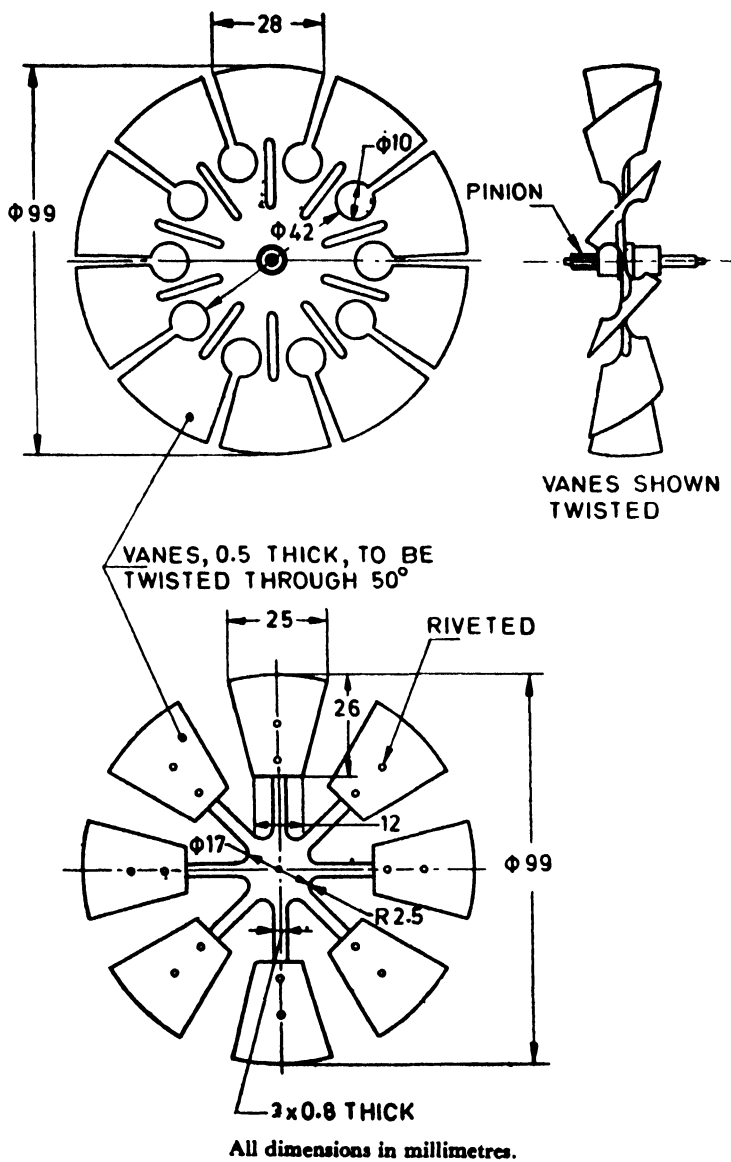


FIG. 2 VANE ROTOR AIRMETER

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5.1.2 Each individual vane blade shall be inclined at an angle of 40° to the wind direction, that is, 50° with the plane of the rotor.

5.1.3 The vane assembly when exposed at right angles to the wind flow with its rear facing the wind shall have clockwise rotation when viewed from the direction of the wind flow.

5.1.4 The rotor assembly shall be accurately balanced and shall rotate in a single plane perpendicular to the axis.

5.2 Protective Shield

5.2.1 The shield shall be 60 mm wide with a circular cross section of 104.5 mm internal diameter.

5.2.2 The shield shall have a suitable hinged holding clip and a brass base plate of 30×40 mm suitably threaded at the centre (for attaching the short handle) fixed rigidly on it.

5.2.3 The shield shall be concentric with the vane rotor and rigidly supported by 3 suitable supporting ribs each at the front and the rear.

5.3 Gear Train Housing and Dial

5.3.1 The housing shall be of circular cross section of about 52 mm diameter having required depth to accommodate suitable gear trains, pinions, start-stop mechanism, zero reset mechanism and jewelled bearing.

5.3.2 The front opening shall have a suitable (anodized aluminium) dial with main and subsidiary scales printed on it.

5.3.3 The main circular scale shall have 100 graduation lines, units and tens marked on the peripheral circle with a pointer at its centre; the subsidiary two/three scales meant for hundreds, thousands and ten thousands shall be printed suitably on the dial over smaller circles having suitable pointers at their respective centres.

5.3.4 The pointers of the subsidiary scales shall move in a slightly lower plane so as not to interfere with the pointer of the main scale.

5.3.5 The dial shall have a suitable glass cover fixed on it with the help of a friction-tight suitable retaining cap.

5.3.6 The housing shall have small cut-outs and holes at appropriate positions for connecting the stop-start mechanism and the zero setting mechanism to their respective operating levers.

5.3.7 The cast housing shall have three symmetrical, supporting ribs suitably shaped on its outer surface to ensure streamline airflow without eddy formation.

5.4 Rear Bearing Support

5.4.1 The cast rear bearing support shall have three symmetrical supporting ribs suitably shaped on its outer surface.

5.4.2 The outer surface of the rear bearing support shall be suitably shaped and finished to ensure streamline airflow and to avoid eddy formation.

5.4.3 The socket containing the rear jewel bearing shall be fixed centrally and positioned suitably by means of adjustable and retaining nuts.

5.5 Gear Wheels and Pinions

5.5.1 Pinions shall be made out of good quality silver steel and shall have accurate, fine teeth cut on them.

5.5.2 Pinion shall be polished and suitably tempered.

5.5.3 Gear wheels shall be made out of hard drawn brass sheet and shall have matching teeth.

5.5.4 The pinion and gear ratios of the entire gear trains shall be such that the indication on the dial shall represent the true run of the wind.

5.6 Handle

5.6.1 A detachable handle about 90 mm long shall have a threaded brass stud, 7 mm long at the top and a threaded brass insert at the bottom.

5.7 Carrying Case

5.7.1 A suitable carrying case with soft padding inside shall be provided for safe storing.

6. PRINTING AND FIGURING

6.1 The dial shall have the figures printed in block. The main scale shall have slightly thicker line for every fifth and tenth graduation lines while all other lines shall be finer and slightly shorter in length.

6.1.1 Every tenth graduation line shall be figured, 10, 20.....90 on the main scale.

6.1.2 Each of the subsidiary scales shall have 10 similar graduation lines of appropriate length and thickness and be figured 0 to 9.

6.1.3 The figure $\times 100$, $\times 1\,000$ and $\times 10\,000$ wherever applicable shall be printed at the top of each of the appropriate subsidiary scales.

6.1.4 The word 'meter' shall be printed in bold letters just below the central pivot carrying the main pointer.

6.1.5 Monogram of the manufacturer shall be printed just above the central pivot carrying the main pointer.

7. WORKMANSHIP AND FINISH

7.1 All the moving parts of the airmeter shall be free to move with the minimum friction.

7.2 The housing and the shield shall have smooth and permanent finish. Suitable primer and finishing paint shall be used to protect the exposed surfaces from deterioration due to exposure.

7.3 The holding clip, glass retaining cap, start-stop lever and the zero reset lever shall be brightly polished and plated with chromium, nickel.

7.4 The dial shall be anodized or enamelled white with neat, crisp and legible marking and figuring.

7.5 The pointers shall be smooth, well formed and painted black. They shall be push fit.

7.6 The start-stop mechanism shall be sturdy and capable of positive functioning.

7.7 The zero reset mechanism shall work accurately to bring all the pointers simultaneously to zero when operated.

8. TESTS

8.1 Balance — The vane rotor shall be perfectly balanced such that it does not show any bias towards any particular direction when held with its axis horizontal.

8.2 Bearings — The vane rotor shall be so free in its bearings that it should respond to very low wind speed of even less than 0.75 km/h.

8.3 Orientation — A setting error of up to 20° with the direction of wind shall not result in more than 2 percent error in the indication of an airmeter of good design.

8.4 Accuracy — When tested in a steady flow, the indication of the airmeter shall agree within ± 2 percent of the true value.

9. MARKING

9.1 Each airmeter shall have the following engraved legibly and neatly on the protective shield and filled with white pigment:

- a) Name of the instrument;
- b) Manufacturer's name or recognized trade-mark, if any; and
- c) Serial number and year of manufacture.

9.2 An arrow showing the direction of wind flow to facilitate proper orientation of the airmeter for actual measurement shall be engraved on the shield. The arrow line shall preferably lie in the horizontal diametrical plane and be terminating in a arrow mark at the front side.

9.3 The word 'ON' and 'OFF' shall be engraved at appropriate position on the shield showing 'Start' and 'Stop' position of the lever.

9.4 The word (zero reset) shall be engraved at appropriate position on the shield.

9.5 The airmeter may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

10. PACKING

10.1 Each instrument shall be packed in its carrying case, after detaching the handle. The handle shall be accommodated in a suitable fixture inside the hinged lid and the carrying case shall be provided adequate cushioning without play, when kept locked.

11. TESTING AND INSPECTION

11.1 Each airmeter shall be tested individually for conformity to all requirements of the specifications.

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